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COAL MINING IN THE MOSCOW BASIN

[Numbers in parentheses refer to appended sources.]

Most Advantageous Length for Coal Faces

(Russian editor's note: The author's conclusions, made on the basis of statistical material, do not take into account the variety of forms of geological and mining conditions of the Moscow basin and cannot therefore be considered to have universal application.)

The length of the coal face is very important for efficient exploitation of coal deposits since it is one of the basic factors influencing labor productivity not only for the section but for the mine as a whole.

As the system of working deposits of the Moscow basin by the long-pillar method developed, the average length of the coal face changed as follows: 1930 - 13.4 meters; 1932 - 16.9 meters; 1935 - 25.3 meters; 1937 - 33.2 meters; 1940 - 39.5 meters; 1946 - 43 meters; 1948 - 45.7 meters; 1950 - 48.2 meters. In 1952, the predominating length of the coal face was 50 meters, indicating a total increase of 10 meters in 10 years' time. With the intensified development of mechanized coal mining in the basin such an increase in the length of the face is clearly inadequate. If the productivity of the cutting machines, combines, and conveyers is to be fully exploited, it will be necessary to create a suitable working front.

The opinion has long prevailed among some workers that it is inexpedient or even impossible to increase the length of the faces beyond 50 meters because of the soft rock of the Moscow basin. Working practice of the basin refutes this opinion, since, in recent years, a number of faces about 80 meters long have been worked with positive results.

With the purpose of obtaining data on the relation between the length of the face and the technological and economic indexes, 92 faces from 30 to 80 meters long, were selected in mines of the Moskvougol' and Tulaugol' combines.

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These were all being worked under average mining and technical conditions, in coal seams of the same thickness, and by the same mechanized methods. The faces were distributed as follows in regard to length:

	Total No of Faces	Length of Face					
		30-39 m	40-49 m	50-59 m	60-69 m	70-79 m	Over 80 m
Number of faces	92	10	17	20	28	11	6
Percent of number of faces	100	10.9	18.9	21.8	30.5	12.0	6.3

On the basis of data obtained it was observed that a change in the average daily output of the face, of labor productivity for the section, and of advance of the face depended on increasing the length of the face. Average technical and economic indexes of work depending on the length of the face are indicated in the following table:

Length of Face (meters)	Mining Method	Avg Thick- ness of Seam Removed (m)	Avg Daily Out- put, (tons)	Avg Labor Productivity for Section (tons)	Avg Ad- vance per Mo (m)
30-39	Machine and explosives	2.42	112	3.16	30.6
40-49	Machine and explosives	2.45	122	3.22	25.4
50-59	Machine and explosives	2.48	137	3.49	23.8
60-69	Machine and explosives	2.37	161	3.63	26.6
70-79	Machine and explosives	2.41	180	3.81	24.9
Over 80	Machine and explosives	2.54	194	3.92	22.8

On the basis of a time analysis of operations of faces, particularly faces with the maximum length for the basin (faces No 1, 3, and 5 of Mine No 35 of the Krasnoarmeyskugol' Trust, about 80 meters long, and face No 76 of Mine No 9 of the Skuratovugol' Trust, about 90 meters long), it can be asserted that cycle work can be carried out also at faces 100-110 meters long.

Estimates on conditions for the efficient use of the MV-60 and KMP-1 cutting machines and the Donbass and VOM-2M combines have been made. During a shift, the MV-60 and the KMP-1 machines can cut faces 160 and 140 meters in length respectively. The Donbass and the VOM-2M can cut faces 120 meters long each.

Until recently scraper conveyers of the ST-6, ST2-11, and SK-20 type were used at coal faces in the Moscow basin. It has been found that the SK-20 scraper conveyor may be 110-120 meters in length when it is working at a face being cut to a depth of 1.8-2.0 meters in a seam 2.5 meters thick.

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To determine the most advantageous length for faces in the 50- to 110-meter range, a comparison was made, taking as criteria the daily output, losses of coal per section, labor productivity, and expenses per ton. The following conditions were assumed in the calculation: (1) the thickness of the seam was taken at 2.5 meters; (2) the method of removal was by machine and explosives; (3) the depth of the cut was 2 meters; (4) organization of labor was one cycle per day; (5) the length of the pillar was 450 meters; and (6) the faces were ordinary ones. Resulting indexes are indicated in the following two tables:

	Unit of Measurement	Length of Faces (meters)			
		50	70	90	110
Output per cycle	Tons	304	425	546	667
Labor productivity per section	Tons	4.90	5.30	5.40	5.58
Labor (number of man-shifts per 1,000 tons)	Man-shift	204	188	185	181
Losses of useful deposit per section	Percent of resources of section	6.7	5.0	4.0	3.6

As seen in the above table, basic technical and economic indexes improve with the increase in the length of the face. Expenses per ton of output depending on the line of the face are indicated in the following table:

	Unit of Measurement	Length of Faces (meters)			
		50	70	90	110
Construction of extraction drifts	Rubles	5.10	3.70	2.80	2.30
Maintenance of extraction drifts	Rubles	0.31	0.22	0.17	0.14
Coal transport along face	Rubles	0.26	0.41	0.49	0.50
Coal transport along extraction drift	Rubles	2.00	1.46	1.18	0.92
Wages to permanent staff of workers	Rubles	2.50	1.17	1.30	1.14
Total	Rubles	10.17	6.96	5.94	5.00

A comparison of faces 110 meters long with faces 50 meters long leads to the following conclusions:

1. The average daily output is increased 118 percent.
2. Labor productivity for the section is increased 12 percent.
3. Labor (number of man-shifts per 1,000 tons of output is decreased 12 percent).

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4. Losses of coal per section are decreased 46 percent.
5. Expenses per ton of coal mined in operations depending on the length of the face are lowered 50 percent.

As a result, the following basic conclusion may be drawn: In the Moscow basin it is possible to convert advantageously to mining operations at faces 100-110 meters long.(1)

Mechanization of Mining Processes in the Moscow Basin

During the postwar years, much has been done in mines of the Moscow basin and other coal regions of the country to extend mechanization of coal mining and of development work. The mechanization of such processes as cutting, breaking up, transporting of coal, and loading it onto railroad cars has been completed. At the same time, there is an inadmissible lag in the Moscow basin in mechanizing the loading of coal onto the conveyor. In this matter, Moscow basin mines lag far behind coal enterprises of other basins. Thus, for example, at the end of 1952, coal loading at the face was mechanized 30 percent in the Donbass, 40-50 percent in Karaganda and the Kuzbass, while in mines of the Moskvougol' Combine the level of mechanized loading at the face was only 4.5 percent.

The machine best fitted for mechanized loading at the face is the coal combine. However, Moscow basin mines are characterized by complicated geological conditions and no completely suitable combine has as yet been designed to cope with these conditions. As early as 1945, the Moscow basin experimented with the VOM-1 cutting and breaking machine designed by Giprouglemash, which cuts, breaks up, and loads coal onto the conveyor. Certain structural defects apparent in the first experiments were eliminated in a revised variant called the VOM-2, and this, in turn, was succeeded by the VOM-2M. Even this improved machine was deemed in general unsuitable for Moscow basin mines and further work on perfecting it was discontinued. One VOM-2M has, however, been used to advantage by a section of Mine No 34 of the Krasnoarmeyskugol' Trust, where the machine achieved a productivity of 10,500 tons per month and where the workers are aiming at a productivity of 12,000 tons per month.

From 1950 on, several Donbass combines were sent to mines of the Moscow basin. This machine was designed for the removal of coal from a seam about one meter thick, but coal seams in the Moscow basin are thicker. Miners of the Moskvougol' Combine, in collaboration with engineers, have introduced many improvements in the Donbass combine and adapted it to local conditions, but some workers of the ministry state that inasmuch as the Donbass combine was not designed for Moscow basin conditions, it will never be used there on a wide scale.

The latest effort of the Ministry of the Coal Industry to solve the problem of mechanized coal loading in the Moscow basin involves the use of the K-14 combine designed by Giprouglemash especially for Moscow basin mines. This is an improved variant of the SKO-1 combine, which was designed in 1950 by a group of engineers of the Moskvougol' Combine, made in local workshops and tried out in the mines with positive effects. Tests now being made with the new K-14 combine in one of the mines of the basin have shown that the cutting unit and also the hydraulic control system are advanced. Nevertheless, the combine still requires considerable improvement; therefore, widespread use of the combine will not start for 1½-2 years. This means that Moscow basin miners will not increase the mechanized loading of coal much either in 1953 or 1954. The shovel still remains the chief device for loading coal at the majority of mines of the basin.(2)

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SOURCES

1. Ugol', No 2, Feb 53
2. Pravda, 28 Feb 53

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